MICROSCOPIC AND ULTRASTRUCTURAL CHARACTERISTICS OF ACUTE GILL LESIONS IN KOI CARP (*Cyprinus carpio*) FOLLOWING IMMERSION CHALLENGE USING *Flavobacterium columnare*

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Specific pathogen-free fingerling koi carp, *Cyprinus carpio*, were exposed by immersion challenge to eight different strains of *Flavobacterium columnar*e, the causative agent of columnaris disease. Five strains proved to be highly virulent, with moribund fish appearing from nine hours post challenge onwards and exhibiting marked gill lesions with ubiquitous whitish discolorations. Three strains could be classified as low virulent, eliciting low or no morbidity/mortality. Light microscopic examination of hematoxylin-eosin stained paraffin sections of the gills of fingerlings inoculated with the highly virulent strains revealed extensive loss of branchial structures. Findings included desquamation and destruction of gill epithelium with fusion of primary and secondary gill filaments. Large parts of these filaments had disappeared and the pertaining areas were covered with necrotic debris. Massive clusters of *F. columnare* bacteria, wrapped in an eosinophilic matrix, were encountered in between necrotic areas. Scanning and transmission electron microscopic observations of the affected gill tissue revealed the presence of long slender bacterial cells of 0.3 µm wide and up to 10 µm in length, shrouded in an extracellular matrix and in close contact with the necrotic gill tissue. Each bacterial cell was enveloped in a dense, thick capsule. Microscopic examination of the gill tissue of fingerlings inoculated with the low virulent strains and of the gills from the control fish revealed intact gill filaments with no bacteria present. This is the first study in its kind to reveal such severe lesions of the gill tissue at macroscopic, light microscopic and ultrastructural level in koi carp. Further research on the formation of these lesions and the bacterial clusters will lead to a better understanding of the pathogenesis of columnaris disease.

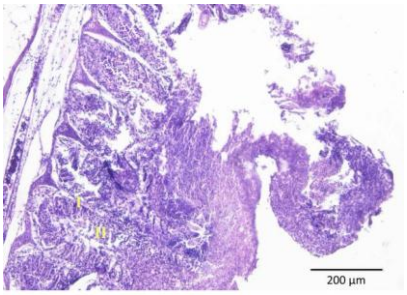

Fig. 1 : Massive necrosis by *F. columnare* of primary (I) and secondary (II) gill filaments of koi carp

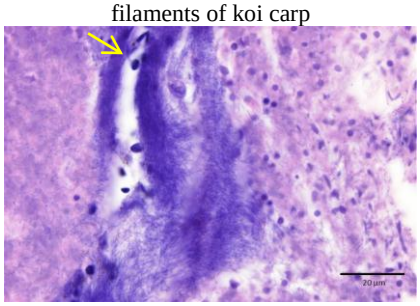
Fig. 2 : Detail of cluster formation of *F. columnare* (arrow) in gill tissue of koi carp

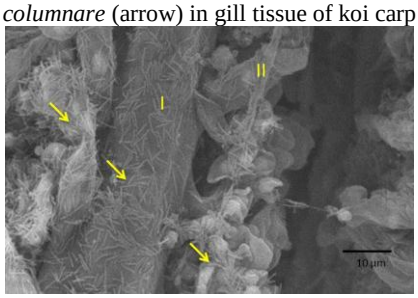

Fig. 3 : Clusters of *F. columnare* (arrows) gathered on primary (I) and secondary (II) filaments of the gill of koi carp

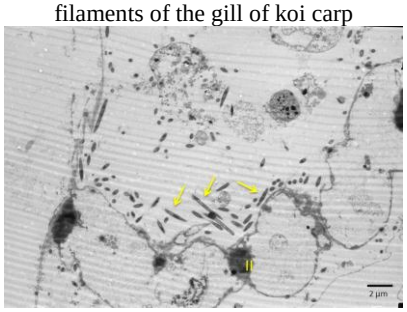

Fig. 4 : *F. columnare* (arrows) lining up along a degenerated secondary gill filament (II) in koi carp

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